ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR PERMITS PROGRAM

TECHNICAL ANALYSIS REPORT

For Air Quality Control Construction Permit No. 074CP03
Project X-239

Alyeska Pipeline Service Company
Pump Station 3

STRATEGIC RECONFIGURATION

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Proposed: December 2, 2004

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Abbreviations/Acronyms

AAC .....Alaska Administrative Code
ADEC.....Alaska Department of Environmental Conservation
APSC.....Alyeska Pipeline Service Company
AS .....Alaska Statutes
ASTM.....American Society of Testing and Materials
CEMS .....Continuous Emission Monitoring System
C.F.R. .....Code of Federal Regulations
COMS.....Continuous Opacity Monitoring System
DLE .....Dry Low Emissions
EPA .....Environmental Protection Agency
HHV .....Higher heating value
MACT .....Maximum Achievable Control Technology
mr&r .....monitoring, recordkeeping, and reporting
NA .....Not Applicable
NAICS .....North American Industry Classification System
NESHAPS .....National Emission Standards for Hazardous Air Pollutants
NSPS .....New Source Performance Standards
PS .....Performance specification
PS 3 .....Pump Station 3
PSD.....Prevention of Significant Deterioration
SIC .....Standard Industrial Classification
SN .....Serial Number
TBD.....To Be Determined

Units and Measures

bhp brake horsepower or boiler horsepower [1]
gr./dscf.....grains per dry standard cubic feet (1 pound = 7,000 grains)
dscf .....dry standard cubic foot
gph .....gallons per hour
kW .....kiloWatts
kW-e.....kiloWatts electric[2]
mmBtu.....million British Thermal Units
ppm.....parts per million
ppmv.....parts per million by volume
tph .....tons per hour
tpy .....tons per year
wt%.....weight percent

Pollutants

CO .....Carbon Monoxide
HAPS.....Hazardous Air Pollutants
H_2S .....Hydrogen Sulfide
NO_X .....Oxides of Nitrogen
NO_2.....Nitrogen Dioxide
NO .....Nitric Oxide
PM-10.....Particulate Matter with an aerodynamic diameter less than 10 microns
SO_2 .....Sulfur Dioxide
VOC .....Volatile Organic Compound

[1] For boilers: One boiler horsepower = 33,472 Btu-fuel per horsepower-hour divided by the boiler's efficiency. For engines: approximately 7,000 Btu-fuel per brake horsepower-hour is required for an average diesel internal combustion engine.

[2] kW-e refers to rated generator electrical output rather than engine output

1.0 Introduction

Alyeska Pipeline Service Company (APSC) submitted a construction permit application to the Alaska Department of Environmental Conservation (the department) for a project at Pump Station 3 (PS 3) dated September 2004 and revised November 15, 2004.

APSC requested concurrent processing of the construction permit and revised operating permit as allowed under 18 AAC 50.310(b). The department intends to incorporate the terms and conditions of this construction permit into the operating permit as an administrative revision, after EPA's 45-day review period.

1.1 Stationary Source Description

PS 3 is an existing crude oil pumping station (SIC code 4612) located 112 miles south of Prudhoe Bay, Alaska. PS 3 functions to transport crude oil from the North Slope of Alaska to the Valdez Marine Terminal of the Trans Alaska Pipeline. The area surrounding PS 3 is classified as attainment or unclassifiable for all pollutants.

1.2 Project Description

The proposed project is part of a strategic reconfiguration initiative to reduce fuel consumption and future maintenance costs. APSC plans to replace the existing crude oil pumps with variable speed electric motor driven pumps to reduce operating and maintenance costs. APSC plans to decommission three Rolls Royce Avon combustion turbines, three Garrett IE831 turbine generators, two Solar Saturn turbine generators, two Eclipse therminol heaters, and three reciprocating internal combustion engines (RICE), (existing Emission Units 1 through 10 and 14 through 16). The only existing equipment that will remain are: two Wells McClain boilers, an applied air system heater, and a Therm-Tec solid waste incinerator.

APSC will replace these units with two Siemens Cyclone combustion turbine generator sets each with a nominal ISO rating of 12.9 MegaWatts (MW), one Caterpillar (Cat) Model 3516B RICE rated at 2,250 kiloWatts (kW), two boilers each rated at 5 mmBtu/hr, and a 65 kiloWatt (kW) RICE (proposed Emission Units 18 through 23). The Cyclone generator sets will provide electric power to drive new variable speed electric crude oil pumps and station auxiliary loads. The 3516B Cat engine will provide backup power to start the Cyclone turbines and power for ancillary equipment when the Cyclone turbines are down. The heaters will provide heat to the buildings, and the 65 kW RICE will provide backup power to the new communication module.

Table 1 shows project emissions as provided in the application and revised by the department. Note that the emission totals listed in the table are **not** the stationary source emissions – "Proposed Potential Emissions" are from proposed Emission Units 18 through 23 and "Past Actual Emissions" are from Emission Units 1 through 10 and 14 through 16 that are to be decommissioned. These emissions estimates do not include emissions from the other emitting units at PS 3 (the two Wells McClain boilers, an applied air system heater, and the Therm-Tec solid waste incinerator).

Table 1 - Project Emissions Summary with Permit Limits, tpy

Pollutant	Proposed Potential Emissions	Past Actual Emission	Change	PSD Major Modification Threshold	PSD Major Modification?
NO_X	163.9	205.3	-41.4	40	NO
CO	1053.1	965.5	+87.6	100	NO
PM-10	8.7	8.0	+0.7	15	NO
VOC	3.2	2.8	+0.4	40	NO
SO_2	10.4	5.8	+4.6	40	NO

APSC used the 10-year look back provisions in 40 C.F.R. 52.21(b)(48)(ii) to calculate "Past Actual Emissions" from the units to be decommissioned as part of this project. APSC treated these emissions as credits to offset the potential emission from the proposed units. APSC based past actual NO_X and CO emission for Units 18 and 19 (Cyclone turbines) on monthly heat consumption, corrected for ambient temperature and heat content. The department did not revise any of APSC's "Past Actual Emission Estimates" provided in the application.

APSC's "Proposed Potential Emissions" calculations in the application include the following assumptions.

1. Emission Units 18 and 19 (Cyclone turbines) limited to 1,050.6 tons of CO per year (tpy).
2. Emission Unit 19 (Cyclone turbine) limited to 240 hours of diesel operation in any twelve consecutive months.
3. Emission Unit 20 (Cat 3515B engine) limited to no more than 600 hours during any twelve consecutive months.
4. Emission Unit 21 (65 kW RICE) limited to 300 hours in any twelve consecutive months.
5. Diesel fuel sulfur limited to 0.2 wt% S.
6. Fuel gas sulfur emissions based 25 ppmv H_2S.
7. NO_X emissions for Units 18 and 19 based on full load, and Dry Low Emissions (DLE) technology.
8. NO_X and CO emissions for Units 18 and 19 based on volumetric concentration data provided by Siemans for past average ambient monthly temperatures at PS 3.

The department revised the proposed emissions estimates as follows:

1 APSC based NO_X and CO emissions for the 65 kW RICE on Tier 1 standards listed in 40 C.F.R. 89.112, Table 1. The department revised the emissions using emission factors from AP-42 Table 3.3-1, because APSC did not provide any supporting vendor or source test data. The resulting emissions changes were negligible.

2 APSC did not provide the basis for the NO_X and CO emissions factors that they used for the 5 mmBtu/hr boilers. The department revised with AP-42 emission factors if they were higher than the emission factors in the application.

APSC assumed fuel gas H_2S content of 150 ppmv in their ambient demonstration. The department made this a permit requirement for ambient air quality protection. APSC used 25 ppmv H_2S to determine whether the modification is significant for Prevention of Significant Deterioration (PSD). This is an appropriate assumption. The application shows that past fuel gas H_2S contents are less than 25 ppmv, and the department does not consider changes in fuel gas H_2S content due to field souring as a modification for purposes of PSD applicability.

1.3 Relevant Permit History

PS 3 is currently operating under Operating Permit No. 074TVP01, issued October 1, 2003.

1.4 Department Findings

1. PS 3 is a crude petroleum pipeline transportation stationary source classified under 18 AAC 50.300(b)(2) as a stationary source containing fuel-burning equipment with a rated capacity of 100 mmBtu/hr or more, and under 18 AAC 50.300(c)(1) as a PSD-Major stationary source that emits more than 250 tons per year (tpy) in an area designated as attainment or unclassifiable. The stationary source is PSD-Major, but the department has not reviewed any project at the stationary source under the state-implementation plan-approved PSD program.

2. The project is classified under 18 AAC 50.300(h)(2) because it could cause an increase in actual emissions beyond current allowable emissions for a pollutant for which an ambient air quality standard has been established in 18 AAC 50.010 (PM-10, SO_2, CO).

3. Under 18 AAC 50.310(n)(2), APSC is required to prepare an ambient air quality assessment for a project classified under 18 AAC 50.300(h)(2). Therefore, APSC was required to submit an ambient SO_2 and PM-10 demonstration. The department also requested a nitrogen dioxide (NO_2) demonstration under the discretionary provision contained in 18 AAC 50.310(c)(5) since NO_2 is a typical pollutant of concern. The department did not ask for a CO demonstration.

4. As restricted by permit limits, the net emissions increase due to this project are below the thresholds in 18 AAC 50.300(h)(3), so this project will not trigger PSD review.

5. The project's fuel burning equipment is subject to state Air Quality Control regulations 18 AAC 50.055(a)(1) for visible emissions, 18 AAC 50.055(b)(1) for particulate matter, and 18 AAC 50.055(c) for sulfur compound emissions.

6. Emission Units 18 and 19 (Cyclone turbines) are subject to federal New Source Performance Standards (NSPS) in 40 C.F.R. 60 Subparts GG and A.

7. PS 3 is not located in a coastal zone district, so is not subject to review under the Alaska Coastal Management Program.

8. The application satisfies the applicable requirements set out in 18 AAC 50.310 and 18 AAC 315(e). Thus, the department has made a preliminary decision to approve the application and has prepared a proposed permit for public notice.

2.0 Ambient Air Quality Protection Requirements

APSC submitted a modeling analysis with their original application and a revised analysis with the updated emission inventory (i.e., with the 2,250 kW backup generator). Appendix A contains the department's review memorandum regarding the original modeling analysis. Appendix B contains the department's review memorandum regarding the revised analysis. APSC's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the ambient air quality standards provided in 18 AAC 50.010, or the maximum allowable increases (increments) provided in 18 AAC 50.020.

The department included the following provisions in the construction permit to ensure APSC complies with key assumptions of their ambient demonstration. These conditions are summarized below:

1. Limit the maximum sulfur content of diesel fuel to 0.20 percent, by weight;

2. Limit the maximum fuel gas H_2S content to 150 parts per million by volume;

3. Limit the annual operation of the Caterpillar 3516B RICE unit to 600 hours;

4. Limit the annual operation 65 kW RICE unit to 300 hours; and

5. Limit the annual diesel fuel consumption of the dual-fuel Siemens Cyclone turbine to 240 hours.

Fuel sulfur mr&r requirements are already included in the operating permit, so the construction permit refers to the operating permit. The only difference is that APSC must report as excess emissions if the construction permit limits are exceeded.

The mr&r for the operating hour limits are fairly straightforward.

3.0 Limits to Avoid Classification as a PSD-Major Modification

As indicated in Section 2.0, APSC is subject to operational limits for ambient air quality protection. APSC also requested limits to prevent PSD-Major modification classification under 18 AAC 50.300(h)(3). With no emission or operational limits, the department concluded that this project would be PSD-Major for CO, NO_X, and SO_2.

3.1 CO Limits

In their emission calculations presented in the application, APSC included an emission limit for Emission Units 18 and 19 of 1050.6 tons of CO per 12 consecutive months, to prevent project classification as a PSD-Major modification. They also included operational limits for Units 20 and 21 of 600 hours and 300 hours per 12 consecutive months, respectively. (The owner

requested limit that limits Unit 19 to 240 hours per year on diesel does not affect CO emissions because of the emission cap.) **Table 2** shows the CO emissions from the project, with bold font indicating emissions that are subject to a limit. The table also shows, in parentheses, the emissions that would result if **no** limits were in place. As shown in the table, the limits are necessary to prevent project classification as PSD-Major for CO.

Table 2 – CO Emissions Summary

Equipment	Emissions in tpy
Siemans Cyclones (Units 18 and 19)	**1050.6** (2800)
Caterpillar 3516B (Unit 20)	**0.7** (9.7)
65 kW RICE (Unit 21)	**0.1** (3.1)
Heaters (Units 22 and 23)	1.7
Total	**1053.1** (2815)
Previous Actual Emissions	965.5
Increase	**+87.6** (1850)
PSD Threshold	100
PSD Major?	**NO** (YES)

APSC desired that the permit reflect CO emission rates at actual operating loads and temperatures, rather than worst case for all loads and temperatures. The Department has included in the permit a step-wise function using the worst case emission rates (in ppmvd) for each temperature and load range calculated as a monthly average, to monitor CO emissions. The emission rates in the permit are based on Cyclone vendor data for various loads and ambient temperatures provided in the application. APSC is required to update the fuel gas data with source test data when it becomes available.

3.2 NO_X Limits

As mentioned under section 3.1, in their emission calculations presented in the application, APSC included operational limits for Units 20 and 21 of 600 hours and 300 hours per 12 consecutive months, respectively. In addition, they included an operational limit for Unit 19, limiting the unit to no more than 240 hours per 12 consecutive months on diesel fuel for NO_X and SO_2 PSD Major avoidance. **Table 3** shows the NO_X emissions from the project, with bold font indicating emissions that are subject to a limit. The table also shows, in parentheses, the emissions that would result if no limits were in place. As shown in the table, the limits are necessary to prevent project classification as PSD-Major for NO_X.

Table 3 – NOX Project Emissions Summary

Equipment	Emissions in tpy
Siemans Cyclones (Units 18 and 19)	**135.4** (224)
Caterpillar 3516B (Unit 20)	**21.3** (310)
65 kW RICE (Unit 21)	**0.2** (5.7)
Heaters (Units 22 and 23)	6.8
Total	**163.7** (546.5)
Previous Actual Emissions	205.3
Increase	**-41.6** (341.2)
PSD Threshold	40
PSD Major?	**NO** (YES)

The permit already contains sufficient mr&r for these limits under ambient air quality protection and CO PSD-Major modification avoidance. No additional mr&r requirements are necessary for CO PSD major modification avoidance.

3.3 SO_2 Limits

Table 4 presents SO_2 emissions given the operational limits for Units 19, 20 and 21 mentioned above, and using diesel fuel sulfur of 0.2 percent sulfur by weight and fuel gas of 25 ppmv H_2S. Bold font indicates emissions with permit limits. The department calculated the potential emissions assuming the same fuel sulfur, but with no operational restrictions; the resulting emissions are shown in parentheses. As shown in the table, the operational limits are necessary to prevent project classification as PSD-Major for SO_2.

Table 4 – SO_2 Project Emissions Summary

Equipment	Emissions in tpy
Siemans Cyclones (Units 18 and 19)	**8.9** (124)
Caterpillar 3516B (Unit 20)	**1.3** (19.1)
65 kW RICE (Unit 21)	**0.02** (0.6)
Heaters (Units 22 and 23)	0.22
Total	**10.4** (144)
Previous Actual Emissions	5.8
Increase	**4.6** (138)
PSD Threshold	40
PSD Major?	**NO** (YES)

The construction permit already contains mr&r for operating hour restrictions (under ambient air quality) and for measuring fuel sulfur (under sulfur compound emissions). No additional mr&r requirements are necessary for SO_2 PSD major modification avoidance.

4.0 Title V Permit Revisions

The permit contains revisions to the Title V permit discovered during the construction permit application review.

5.0 Emission Standards

For each new stationary source or modification subject to construction permitting, the applicant must show that the proposed units comply with state and federal emission standards. The department has adopted federal New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAP), by reference in 18 AAC 50.040. In addition, the department has emission unit-specific emission standards listed in 18 AAC 50.050-090.

5.1 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

NESHAPs are promulgated by EPA. 18 AAC 50.040 adopts the federal HAP regulations, 40 CFR Part 61, and 40 CFR Part 63, by reference. EPA may delegate to each state the authority to implement and enforce certain standards for sources located in that state. EPA has delegated authority to the department to administer the NESHAPs program. However, the department has yet to adopt the newly promulgated federal standards by reference. The new Maximum Achievable Control Technology (MACT) standards apply to combustion turbines and RICE at major stationary sources of HAPs.

PS 3 is not a major stationary source of HAPs. The total potential HAP emissions for the stationary source are 22.5 tpy and the maximum potential individual HAP emissions for the stationary source are 9.0 tpy. As such, PS 3 is not a HAP-major stationary source and the turbines are not subject to the federal MACT standards for turbines and the RICE MACT standards for the reciprocating engines.

5.2 New Source Performance Standards (NSPS)

The U.S. Environmental Protection Agency (EPA) regulates NSPS. The intent of NSPS is to provide technology-based emission control standards. EPA may delegate to each state the authority to implement and enforce standards of performance for new stationary sources located in that state. The department has incorporated by reference the NSPS effective July 1, 2001, for specific industrial activities, as listed in 18 AAC 50.040. However, EPA has not delegated to the department the authority to administer the NSPS program at this time.

For this project, the two proposed Cyclone turbines are subject to NSPS, but the RICE is not.

5.2.1 Subpart A: General Provisions

Subpart A contains notification, monitoring, recordkeeping, and reporting requirements. The applicant must submit in writing to EPA and the department the actual date of initial startup of an affected facility postmarked within 15 days of such a date per 40 C.F.R. 60.7(a)(3).

Subpart A also requires the applicant to maintain records of the occurrence and duration of any startup, shutdown, or equipment malfunction in the operation of the affected facility, and

maintain these records for no less than two years. The department included NSPS Subpart A compliance requirements in the permit.

5.2.2 Subpart GG: Stationary Gas Turbines

Emission Units 18 and 19 (new Siemens Cyclone turbines) are affected facilities under 40 C.F.R. 60.330, Subpart GG, Standards of Performance for Stationary Gas Turbines. These turbines were modified, constructed, or reconstructed after October 3,1977, and have heat input rating greater than 10.7 gigajoules per hour (equivalent to 10 million Btu/hr), based on lower heating value of the fuel. These NSPS standards incorporate limits on the affected facility's SO_2 and NO_X emissions. The permit contains the requirements of Subpart GG.

Standards for Nitrogen Oxides

Emission Units 18 and 19 are subject to 40 C.F.R. 60.332(a)(2) because they are classified under 40 C.F.R. 60.332(a)(3)(b) as affected facilities with heat input at peak-load equal to or greater than 10.7 gigajoules per hour (10 million Btu/hr), but less than 107.2 gigajoules per hour (100 million Btu/hr), based on the lower heating value of fuel fired, and constructed after October 3, 1977.

The NSPS NO_X standard in 40 C.F.R. 60.332(a)(2) states that no owner or operator shall cause to be discharged into the atmosphere from any stationary gas turbine, any gases which contain NO_X in excess of:

$$STD = \frac{14.4}{Y} = F$$

Where:

STD = allowable NO_X emissions, percent by volume at 15 percent O_2 corrected to ISO conditions and on a dry basis.

Y = manufacturer's rated heat rate at manufacturer's rated peak load, (kilojoules per watt hour), or actual measured heat rate based on the lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour.

F = NO_X emission allowance for fuel-bound nitrogen as defined in 40 C.F.R. 60.332(a)(4). The use of F is optional and the owner or operator may accept an F-value of zero, or choose to apply a NO_X allowance for fuel-bound nitrogen and determine the appropriate F-value in accordance with 40 C.F.R. 60.332(a)(4).

The limit for Emission Units 18 and 19 is 212 ppmvd at 15 percent O_2 each and ISO conditions when the units are firing gas. Natural gas-fired turbines are exempt from 40 C.F.R. 60.332(a)(2) when firing emergency fuel, as described in 40 C.F.R. 60.331(r).

The department has incorporated the NSPS Subpart GG NO_X emission standard, monitoring, reporting, and performance test requirements in the permit.

Standards for Sulfur Dioxide

Emission Units 18 and 19 are subject to the SO_2 standards as stated in 40 C.F.R. 60.333. The owner or operator shall not discharge gases into the atmosphere from a stationary gas turbine with SO_2 in excess of 0.015 percent by volume (150 ppmvd) at 15 percent O_2 and on a dry basis, or no owner or operator shall burn fuel with greater than 0.8 percent sulfur by weight.

APSC proposes to comply with this requirement by burning fuel gas with a hydrogen sulfide content less than 150 ppmv, and diesel fuel with a sulfur content less than 0.2 percent by weight, as set out in the permit. The department has incorporated a fuel gas total sulfur content limit with NSPS monitoring, and testing requirements in the permit.

Recordkeeping and Reporting

APSC shall maintain records of all sulfur monitoring data for five years as set out in the permit. The department has incorporated the recordkeeping and reporting requirements of NSPS Subpart GG in the permit in compliance with the standards.

Test Methods and Procedures

APSC shall determine compliance with the SO_2 standard per 40 C.F.R. 60.335(b)(10) and 40 C.F.R. 60.334(h)(1). APSC shall use methods described in these sections, or an EPA-approved alternative. APSC may use fuel analysis performed by owner/operator, service contractor, fuel vendor, or other qualified agency under 40 C.F.R. 60.335(b)(11).

5.3 Alaska Emission Standards

Industrial processes and fuel-burning equipment at the PS 3 are subject to specific visible emission, particulate, and sulfur compound emission standards as listed in 18 AAC 50.055. The department has included in the permit monitoring, recordkeeping, and reporting (mr&r) requirements for compliance with the standards.

5.3.1 Visible Emissions

Emission Units 18 through 23 (new turbines, engines, and boilers) are industrial processes and fuel burning equipment and are subject to a 20 percent visible emission standard as listed in 18 AAC 50.055(a)(1).

APSC did not provide visible emission compliance demonstrations in the application for any of the proposed turbines, engines, and boilers. The department will not require an initial demonstration of compliance for Unit 18 or for Unit 19 when firing fuel gas. The department has found in previous permit decisions that, if properly maintained and operated, gas-fired equipment is not likely to have visible emissions. For Unit 18, APSC is required to certify annually that the unit fired only fuel gas, in accordance with the Title V permit requirements. Unit 19 is limited to no more than 240 hours per 12 consecutive month period on liquid fuel for

PSD avoidance. The department assumes that the remainder will be on fuel gas and there are no on-going monitoring, recordkeeping, and reporting requirements (mr&r) for Unit 19 for fuel gas operation.

Liquid fuel fired equipment has the potential to emit visible emissions. Therefore, the permit requires initial compliance demonstrations for liquid fuel operation of Units 19 through 23. After the initial compliance demonstration, APSC is required to monitor, record, and report visible emissions in accordance with Section 13 of initial Operating Permit 074TVP01. Department guidance AWQ 02-014 waives visible emission and PM monitoring for units that a Permittee operates less than 400 hour per calendar year on liquid fuel. Note that the 400 hour visible emission requirement in Section 13 of the operating permit is for a calendar year, while the operating hour restrictions in this permit are for 12 consecutive month periods.

5.3.2 Particulate Matter

Emission Units 18 through 23 are subject to the state PM standard of 0.05 grains per dry standard cubic foot of exhaust gas (gr./dscf) in 18 AAC 50.055(b)(1).

As with the visible emission standard, the department has waived both the initial compliance demonstration and on-going mr&r for gas-fired equipment, because the department has found the gas-fired equipment inherently has negligible PM emissions. However, Alyeska may be required to conduct PM source tests if a visible emissions source test results in high opacity.

APSC's application included a PM demonstration for the turbines while operating on liquid fuel. They estimated that the turbines would have PM emissions of 0.0025 gr/dscf on liquid fuel. The department agrees with APSC's demonstration for the turbine and has not included in initial compliance demonstration requirement in the permit.

APSC submitted a PM compliance demonstration for the Cat 3516B engine and 65 kW RICE on November 26, 2004. They estimated PM emission of).011 gr/dscf for the Cat 3516B engine and 0.005 gr/dscf for the 65 kW RICE. The department agrees with APSC's demonstration for the engines and has not included in initial compliance demonstration requirement in the permit.

On-going mr&r for the turbines and engines in the construction permit refers to the operating permit.

5.3.3 Sulfur Compound Emissions

Emission Units 18 through 23 are subject to the sulfur compound emission standard as set out in 18 AAC 50.055(c). Sulfur compound emissions from fuel-burning equipment, expressed as SO_2, may not exceed 500 ppm averaged over a period of three hours. As described in the Statement of Basis for Operating Permit No. 074TVP01, this is equivalent to a liquid-fuel sulfur content of 0.75 percent for stoichiometric conditions and to 4,200 ppmv fuel gas H_2S content.

The construction permit refers to the operating permit for mr&r requirements.

6.0 Permit Administration

6.1 Permit Terms and Conditions

This permit contains the terms and conditions under which APSC is authorized to implement the strategic reconfiguration of PS 3.

6.2 Standard Conditions

Standard permit conditions listed in 18 AAC 50.346(a) applicable to operating and construction permits, specifically emission fees, air pollution prohibited, excess emission and permit deviation reports are already listed in initial Operating Permit No. 074TVP01. With the exception of emission fee condition, this project does not trigger any changed to these conditions so they are not included in this construction permit except by reference to the operating permit. The assessable emissions for this stationary source will change. The department will include the revised assessable emissions in the operating permits administrative revision.

6.3 Construction Permitting Procedures

The department's Title V Office has oversight for all reports, surveillance, records, and inspections of permitted stationary sources. Therefore, APSC shall submit all plans, reports, except excess emission reports, and notices required under this permit to the Title V Fairbanks office, as provided for in Section 10 of initial Operating Permit No. 074TVP01. The permit requires excess emission and permit deviation reports be submitted as described in condition 43 of initial Operating Permit No. 074TVP01.

Appendix A
Modeling Memorandum

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File
DATE: October 21, 2004

FILE NO.: X239 – Modeling

THRU: Jeanette Brena.
Construction Permits, Acting Supervisor
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FROM: William Ashton
Environmental Engineer Assist.
Air Permits Program

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SUBJECT: Review of Alyeska PS3 Ambient Assessment

This memorandum summarizes the Department's findings regarding the ambient air assessment conducted by Alyeska Pipeline Service Company (Alyeska) for Pump Station 3 (PS 3), as required under 18 AAC 50.315(b)(1)(A).[3] Alyeska is developing a "Strategic Reconfiguration" of the pipeline. Alyeska is reconfiguring its pump stations to operate more efficiently. Alyeska submitted the assessment on September 10, 2004 in support of their air quality construction permit application. The project is not subject to review under the State's Prevention of Significant Deterioration (PSD) program. Alyeska's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010, or the maximum allowable increases (increments) listed in 18 AAC 50.020.

BACKGROUND

PS 3 is an existing stationary source located in the northern foothills of the Brooks Range. The pump station has been operational since before 1980. The area is unclassified in regards to compliance with the ambient air quality standards. PS 3 is currently classified as a PSD major source under 18 AAC 50.300(c)(1) and is operating under Air Quality Control Operating Permit 074TVP01.

Alyeska plans to decommission three 24,000 horse-power (hp) Rolls Royce Avon combustion turbines, three 510 kilowatt (kW) Garrett combustion turbines, two 800 kW Solar Saturn combustion turbines, two 20.6 million Btu per hour (MMBtu/hr) Eclipse Therminol heaters, and three reciprocating internal combustion engine (RICE) generators located at the mobile construction camp. The existing firewater pump, two 1.7 MMBtu/hr Weils McClain Boilers, 2.8 MMBtu/hr Applied Air System Heater, two 0.76 MMBtu/hr Burnham heaters and 300 pound per hour incinerator will remain. The removed equipment will be replaced with two 12.9 megawatt (MW) Siemens Cyclone combustion turbine generators, a single 750 kW Caterpillar 3412C (Cat 3412C) RICE, two 5 MMBtu/hr boilers, and a single 65 kW RICE. The new turbines will provide electrical power to drive new variable speed crude oil pumps.

Alyeska requested operational restrictions under 18 AAC 50.305(a)(4) to avoid classifying this project as a PSD major-modification under 18 AAC 50.300(h)(3). The modification will nevertheless increase the annual carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM-10), and volatile organic compound (VOC) emissions

[3] Alaska's air quality permit program and associated regulations underwent a major revision that became effective October 1, 2004. Applicants who submitted a complete permit application prior to this date have the option of having their applications processed under either the "new" or "old" program. Per Alyeska's request, the Department is processing the PS 3 application and modeling analysis under the old program/regulations.

and is therefore, classified under 18 AAC 50.300(h)(2) for these pollutants. The project will decrease the annual oxides of nitrogen (NOx) emissions.

According to 18 AAC 50.310(n)(2) modifications classified under 18 AAC 50.300(h)(2) must have an ambient nitrogen dioxide (NO_2), SO_2, and PM-10 demonstration if there is an increase in allowable emissions for those pollutants. Therefore, Alyeska was required to submit a SO_2 and PM-10 demonstration. The Department requested a NO_2 demonstration under the discretionary provision contained in 18 AAC 50.310(c)(5) since NO_2 is a typical pollutant of concern. The Department did not ask for a CO demonstration.

Alyeska did not submit a formal modeling protocol for this project. However, Alyeska's consultant, RETEC Group, Inc. (RETEC), did contact Alan on several occasions regarding the modeling analysis. The project file contains copies of several electronic mail (e-mail) messages from this pre-application period.

APPROACH

Alyeska used computer analysis (modeling) to predict the ambient NO_2, SO_2, and PM-10 air quality impacts. RETEC conducted the modeling on behalf of Alyeska.

Model Selection

Alyeska used the U.S. Environmental Protection Agency's (EPA) *Industrial Source Complex Short-Term 3* (ISCST3) model for the ambient analysis. ISCST3 is an appropriate model for this analysis. Alyeska used the current version of ISCT3 (version 02035).

RETEC made minor code changes to ISCST3 to turn off stack tip downwash for capped and horizontal stacks.[4] This change is acceptable and consistent with EPA guidance regarding the modeling of horizontal stacks and vertical stacks with rain caps (see discussion under the "Horizontal/Capped Stacks" section of this memorandum). The Department previously accepted this code change in the ambient analysis that RETEC conducted in support of the Pump Station 5 strategic reconfiguration.[5] RETEC's code change is applicable and appropriate for the PS 3 project as well.

ISCST3 will not calculate impacts within the "cavity" downwash region. It instead provides a listing of the unit-receptor combinations for which no calculations are made. To overcome this limitation with ISCST3, Alyeska used ISC-PRIME to calculate the cavity zone impacts for the unit-receptor combinations listed by ISCST3. Alyeska used the current version of ISC-PRIME (version 04269).

Alyeska used a spreadsheet to combine the ISCST3 and ISC-PRIME results on a receptor-by-receptor basis. This is a conservative approach since the ISCST3 and ISC-PRIME impacts are paired in space (i.e., they occur at the same receptor), but not in time (i.e., the maximum predicated ISCST3 and ISC-PRIME impacts do not necessarily occur at the same time or under the same meteorological conditions).

ISC-PRIME should only be used to model vertical stacks without rain caps. It should not be used to model horizontal or capped stacks. Some of the emission units at PS 3 have capped stacks. Therefore, the Department checked the unit-receptor combinations rejected by ISCST3 to see if the capped stacks units are listed. All but four of the unit-receptor combinations rejected by ISCST3 are for emission units with uncapped stacks, and are therefore, acceptable. The exception regarded two fenceline receptors located near the two 0.76 MMBtu/hr Burnham heaters, which have capped stacks.

In most cases, the Department would reject an ambient demonstration that used ISC-PRIME to model a capped stack. However, the Department made an exception and allowed the use of ISC-PRIME for the PS 3 assessment. The Department's reasons for making this exception are:

1. The Burnham heaters are extremely small units. They are considered as insignificant for purposes of Title V permitting and therefore, are not even listed in the existing operating permit.

[4] RETEC considers the ISCST3 modification as proprietary information. RETEC asked the Department to not release their source code or executable code to third parties without their prior written consent.

[5] *Review of Alyeska PS5 Ambient Assessment* (Memorandum from Alan Schuler to File, June 24, 2004).

2. ISCST3 only rejected the two nearest receptors (i.e., ISCST3 estimated the ambient impact from these units at all other receptors).
3. The Burnham heaters are baseline units and therefore, do not consume increment. Therefore, the issue is further limited to just the AAAQS demonstration.
4. The maximum total impacts (PS 3 plus background) are less than a fifth of the AAAQS. It is unlikely that there is a five-fold margin of error associated with the Burnham heaters. Therefore, the analysis is adequate.

ISC-PRIME is a non-guideline model and therefore, requires permission for use on a case-by-case basis from both the Department and EPA. The Department obtained permission from EPA Region 10 to use ISC-PRIME for this application on September 27, 2004. The use of non-guideline models are also subject to public comment. Therefore, the Department is including a request for comment regarding the use of ISC-PRIME in the public notice.

Meteorological Data

ISCST3 and ISC-PRIME require hourly surface meteorological data to estimate plume dispersion. Alyeska used one year (March 1, 2002 through February 28, 2003) of site-specific surface data. The use of site-specific surface meteorological data is appropriate.

The Department approved Alyeska's Quality Assurance Project Plan for the PS 3 meteorological monitoring program on June 13, 2002.[6] The Department's quality assurance group is currently reviewing the meteorological data. Based on their initial assessment, the data appears to be valid and acceptable.

ISCST3 and ISC-PRIME also requires the use of adequately representative upper air data. The nearest National Weather Service (NWS) upper air stations are located in Fairbanks (490 km south of PS 3) and in Barrow (400 km northwest of PS 3). These are sufficient distances to question whether either data set is adequately representative of the upper air conditions at PS 3.

Alyeska raised the issue regarding upper air data prior to installing the PS 3 meteorological station. To address the issue, Alyeska submitted a sensitivity modeling analysis in August 2001 using 1991-1995 "Pad A" Prudhoe Bay surface meteorological data and the following variety of mixing heights:

- mixing heights based on concurrent NWS upper air data from Barrow; and
- fixed mixing heights at 40 meters above ground level (m-agl), 50 m-agl, 100 m-agl, and 200 m-agl.

Alyeska found that the modeled impacts are identical, or nearly identical, for mixing heights at or above 50 meters. The Department reviewed Alyeska's analysis and replied that mixing height is not a critical parameter when modeling the emission units at PS 3 with ISCST3.[7]

Alyeska used concurrent Barrow NWS upper air data for the strategic reconfiguration modeling analysis. Alyeska choose Barrow data since it is the nearest NWS station and since Barrow is located on the same side of the Brooks Range as PS 3. Based on the findings of Alyeska's sensitivity analysis, the Department accepts the use of Barrow NWS data for this application.

Alyeska used a variation of EPA's *Meteorological Processor for Regulatory Models (MPRM)* program to prepare the meteorological data for use in ISCST3 and ISC-PRIME. MPRM is EPA's standard program for processing site-specific meteorological data. However, the standard version available on EPA's web-site (version 99349) does not work for locations above the Arctic Circle. MPRM version 99349 has a run-time error that occurs during periods of either 24-hours of daylight or darkness. This version also incorrectly calculates the stability class during these periods.

EPA's Office of Air Quality Planning and Standards (OAQPS) developed a patch in December 2001 that resolves the run-time error. The patch is available upon request and was used by Alyeska for this project.

[6] Letter from Jim Baumgartner (ADEC) to Don Mark Anthony (Alyeska), *Alyeska Pipeline Service Company Pump Station 3 & 4 PSD file, Valdez Marine Terminal Revision, Meteorological Monitoring/Quality Assurance Plan Review, Project X152,* June 13, 2002.

[7] Letter from Alan Schuler (ADEC) to Don Mark Anthony (Alyeska), *Upper Air and Pre-Construction Pollutant Monitoring at Pump Stations 3 and 4,* September 11, 2001.

The stability class error has also been a long-standing issue. RETEC originally notified OAQPS and the Department of the error on December 13, 2001.[8] RETEC continued to raise the issue, along with a proposed code modification, on January 24, 2003, September 25, 2003 and in regards to the PS 3 project, on June 22, 2004. EPA Region 10 indicated in a February 6, 2003 e-mail that they and OAQPS were working on a version of MPRM that would properly work in Alaska.[9] However, this version has not yet been completed or released. Therefore, RETEC used their modified code for this project. RETEC's modification properly calculates stability in a manner consistent with EPA guidance. Therefore, RETEC's modification is appropriate and warranted.

EPA allows applicants to compare the high second-high (h2h) modeled concentration to the short-term air quality standards and increments if at least one year of temporally representative site-specific, or five years of representative off-site data, are used. When these criteria are not met, then applicants must use the high first-high (h1h) concentration.

Alyeska would typically be allowed to use the h2h concentration since they used site-specific meteorological data. However, Alyeska's approach for combining the ISC-PRIME impacts with the ISCST3 impacts only allowed them to use the h1h impacts.[10]

Emission Unit Inventory

Alyeska included the proposed units (the two Siemens Cyclone turbine generators, the CAT 3412C, the 65kW RICE unit, and the two boilers) in the AAAQS demonstration. They also included the existing firewater pump, Weils McClain boilers, Applied Air System heater, Burnham heaters and incinerator. The locations of the modeled emission units are shown in Figure 4-4 of the permit application.

Alyeska limited the increment assessment to the proposed units and the Weil McClain boilers, and the Applied Air System Heater since they were installed after the NO_2, SO_2 and PM-10 baseline dates. Alyeska excluded the Burnham heaters, firewater pump and incinerator from the increment analysis since they were installed prior to the baseline dates. Alyeska could have taken credit in the increment assessments for the removed units, since they contributed to the baseline concentrations. However, they do not have actual emissions data from the baseline dates for these units.[11] Therefore, Alyeska did not include increment credits in the assessments. This approach provides conservative results and avoids the need to incorporate EPA's policy regarding the modeling of increment credits in complex terrain.

Emission Rates and Stack Parameters

The assumed emission rates and stack parameters have significant roles in an ambient demonstration. Alyeska listed the modeled emission rates and stack parameters in Tables 4-2 through 4-5 of the application. They assumed the following annual operational limits:

- Cat 3412C – 600 hours
- 65 kW RICE unit – 300 hours
- firewater pump – 500 hours[12]

[8] Electronic mail (e-mail) from Pete Miller (RETEC) to Desmond Bailey (OAQPS), *Re: FW: Problem with processing Pad A data with MPRM*, December 13, 2001.

[9] E-mail from Herman Wong (EPA Region 10) to Alan Schuler (ADEC), *Re: mprm v03028*, February 6, 2003.

[10] The h2h concentration is determined by ranking the concentrations by magnitude at each receptor, and then taking the highest of the second-high values. By definition, each receptor must have concentrations from at least two different periods in order to determine the second-high concentrations and the subsequent h2h value. Alyeska combined a *single* set of concentrations from each model, which is insufficient for determining second-high values. Note: Alyeska appropriately used the first-high concentrations from each model rather than the second-high concentrations. Combining second-high concentrations can underestimate the combined h2h value, which could consist of the first-high concentration from *one* of the two models.

[11] Alyeska commenced construction of the removed units prior to January 6, 1975, which makes them part of the SO_2 and PM-10 baseline concentration per 18 AAC 50.020(e)(1), and the NO_2 baseline concentration per 18 AAC 50.020(e)(2). Alyeska started operating the units in 1977, which is prior to the 1978 PM-10 baseline date, the 1979 SO_2 baseline date, and the 1988 NO_2 baseline date. Therefore, the actual emissions must be used instead of the allowable emissions for determining the baseline concentrations.

[12] Alyeska modeled the firewater pump at the potential emissions established under EPA guidance, *Calculating Potential to Emit (PTE) for Emergency Generators*, September 6, 1995. Since this is the unit's PTE, no permit restriction is required. According to Alyeska, past usage has been well below 500 hours per year.

- Weils McClain Boilers – 1,000 hours (both units combined) on diesel and fuel gas the remaining part of the year[13]
- Applied Air Systems Heater – 500 hours on diesel and fuel gas the remaining part of the year[11]
- dual-fuel Siemens Cyclone turbine – 240 hours on diesel and fuel gas the remaining part of the year.

Alyeska assumed all other units operate 8,760 hours per year. Most of the modeled emission rates and stack parameters are correct. However, the following issues warrant additional discussion.

Load Analysis

The maximum ambient concentration does not always occur during the full-load conditions that typically produce the largest emissions. The relatively poor dispersion that occurs with cooler exhaust temperatures and slower part-load exit velocities may produce the maximum ambient impacts. Therefore, EPA recommends that part-load conditions by analyzed as well as full-load conditions. In addition to part-load concerns, turbine emissions, stack temperatures and exhaust flow rates vary with ambient temperature. Therefore, ambient temperatures must also be evaluated when modeling turbines.

Alyeska used a variation of the "M-Factor" described in EPA's *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, to determine the worst-case load and ambient temperature for the Siemens Cyclone Turbines. EPA developed the M-factor to help modelers select the worst-case stack parameters in a screening assessment. The M-Factor essentially weights the emission rate by the stack parameters. The stack parameters included in EPA's M-factor equation are stack height, volume flow rate and exit temperature. Alyeska dropped stack height from their variation of the M-Factor equation since stack height does not vary by load. They likewise used exit velocity instead of volume flow rate.[14]

Alyeska calculated the modified M-Factor for each modeled pollutant at several loads and ambient temperatures. They then used the stack parameters associated with their worst-case factor in the modeling analysis. RETEC provided the M-Factor spreadsheet via e-mail on October 1, 2004.[15] They provided an updated spreadsheet via e-mail on October 5, 2004.[16] The full-load condition at minus 20°F provides the worst-case M-Factor. Therefore, Alyeska used the full-load stack characteristics at minus 20°F to model the short-term impacts from the Siemens Cyclone turbines. They used full-load condition at 18°F (the average temperature at PS 3) to model the annual average impacts from the Siemens Cyclone turbines. The load condition and ambient temperatures used by Alyeska are appropriate.

Ambient SO_2 Modeling

SO_2 emissions are directly related to the amount of sulfur in the fuel. Alyeska plans to use both gas and diesel fuel to operate their existing and proposed combustion sources. The sulfur in fuel gas is in the form of hydrogen sulfide (H_2S). Alyeska assumed the gas-fired units are burning gas with a maximum H_2S content of 150 parts per million by volume (ppmv). Alyeska assumed the diesel-fired units are burning fuel with a maximum sulfur content of 0.20 percent, by weight. Alyeska asked that we include both assumptions as permit limits.

PM-10 Emission Rates

While discussing the modeled emission rates with RETEC, RETEC discovered that the 24-hour PM-10 emission rate for the Siemens Cyclone turbines did not include an adjustment between the lower and higher heating value. Therefore, the modeled gas-fired emission rate is 11% lower than what should have been modeled, and the modeled diesel-fired emission rate is 7% lower than what should have been modeled.

The modeled 24-hour PM-10 impacts do not threaten the air quality standards and increments. Therefore, we increased the 24-hour PM-10 impacts by 11% (the worst-case error), rather than asking Alyeska to remodel. This

[13] The existing operating permit restricts liquid fuel operation for the dual-fueled Weils-McClain Boilers and the Applied Air Systems Heater on *both* an hourly and fuel consumption basis. Table 4-4 of the application repeats these limits. However, Alyeska only used the hourly limits in calculating the modeled emission rates.

[14] The M-Factor equation on page 4-6 of Alyeska's application indicates that they used exhaust flow rate instead of exit velocity. However, in reviewing the M-Factor spreadsheet, the Department noted that Alyeska actually used exit velocity. Either value works is appropriate in cases where the stack diameter is constant, as is the case here.

[15] E-mail from Pete Miller (RETEC) to Alan Schuler (ADEC) and William Ashton (ADEC), *PS3 and PS4 Spreadsheets*, October 1, 2004.

[16] E-mail from Pete Miller (RETEC) to Alan Schuler (ADEC) and William Ashton (ADEC), *Pump Station 4 Strategic Reconfiguration modeling issues*, October 5, 2004.

approach is conservative and still demonstrates compliance with the 24-hour PM-10 AAAQS and Class II increments.

Horizontal/Capped Stacks

The presence of non-vertical (e.g., horizontal) stacks or stacks with rain caps requires special handling in an ISCST3 analysis. EPA recommends that the plumes be characterized with an artificially small exit velocity (0.001 m/s) and an "equivalent diameter" to conserve the volume flow rate.[17] Alyeska used EPA's recommended approach when modeling with ISCST3 to characterize the emission units with rain caps.

EPA also recommends turning the stack-tip downwash (STD) algorithm off for capped stacks and stacks with non-vertical outlets. Modelers should instead reduce the stack height for *capped stacks* by three-times the actual stack diameter. ISCST3 contains a switch to turn off STD. However, the switch turns the STD algorithm off for *all* emission units in the input file. Consequently, this unilateral approach can be problematic for sources with a variety of stack discharge styles.

All of the boilers and heaters at PS 3 have or will have capped stacks. Therefore, as previously noted, RETEC modified ISCST3 to turn off STD for all units with capped stacks (i.e., all units with a 0.001 m/s exit velocity). They also reduced the modeled stack height for these units by three-times the actual diameter. Alyeska's approach for modeling capped stacks is appropriate.

Other Comments

The Department found the following minor errors in the application:

- Table 4-3 lists two different stack heights for the dual-fuel Siemens Cyclone turbine (Model ID "CYC1"). The stack height used in the modeling files is 14.63m (48-feet).
- Table 4-5 indicates the equivalent diameter for the Applied Air Systems Heater is 22.4m. The correct value is 28.7m, which is the value Alyeska actually used in the modeling analysis.

Ambient NO_2 Modeling

The modeling of ambient NO_2 concentrations can sometimes be refined through the use of ambient air data or assumptions. However, Alyeska took a very conservative approach of assuming that all NOx emissions are converted to NO_2. Alyeska's approach is acceptable.

Ambient Air Boundary and Receptor Grid

For purposes of air quality modeling, "ambient air" means outside air to which the public has access. Ambient air typically excludes that portion of the atmosphere within a stationary source's boundary. However, there may be exceptions if there are portions of the stationary source that are accessible to dependants or other members of the public.

Alyeska appropriately used the fence line as the ambient boundary. They used the following receptor grid density:

- 25-meter spacing along the fence line,
- 25-m resolution from the fence line outward to 100 meters,
- 100-m resolution from the 25-meter grid outward to 1 kilometer in each cardinal direction, and
- 500-m resolution from the 100-meter grid outward to 5 kilometers in each cardinal direction.

Alyeska's receptor grid spacing is appropriate for this analysis.
Alyeska interpolated the receptor elevations from 1:63,360 Digital Elevation Model data obtained from the United States Geological Survey (USGS). They then overlaid the receptor elevation contours on a USGS topographical map to verify the resulting receptor grids. Alyeska provided the overlays in Figures 4-5 and 4-6 of their modeling report. Alan further confirmed the modeled receptor elevations by using Surfer® to generate contoured receptor elevations. The modeled receptor elevations match the contours shown in the USGS quad map and are therefore, acceptable.

[17] EPA Memorandum from Joseph Tikvart to Ken Eng, *Proposal for Calculating Plume Rise for Stacks with Horizontal Releases or Rain Caps for Cookson Pigment, Newark, New Jersey*, July 9, 1993.

Downwash

Downwash refers to conditions where the plume pattern is influenced by nearby structures. Downwash can occur when a stack height is less than a height derived by a procedure called "Good Engineering Practice," as defined in 18 AAC 50.990(44). The modeling of downwash-related impacts requires the inclusion of dimensions from nearby buildings. EPA has established specific algorithms for determining which buildings must be included in the analysis and for determining the profile dimensions that would influence the plume from a given stack. EPA has incorporated these algorithms in a separate computer program called the "Building Profile Input Program" (BPIP).

Alyeska used BPIP (version 04112) to determine the building profiles needed by ISCST3. This is the current version of BPIP. Alyeska used "BPIPPRM" (the Prime version of BPIP) to determine the building profiles needed by ISC-PRIME. Alyeska used the current version of BPIPPRM (version 95086).

Off-Site Impacts

In a cumulative impact analysis, the applicant must include impacts from large sources located within 50 kilometers of the applicant's significant impact area. These impacts from "off-site" sources are typically assessed through modeling.

PS 3 is located in a remote location with no nearby off-site sources. Therefore, Alyeska did not include any off-site sources in the assessment. Alyeska's approach regarding off-site sources is appropriate.

Background Concentrations

The background concentration represents impacts from sources not included in the modeling analysis. Typical examples include natural, area-wide, and long-range transport sources. The background concentration must be evaluated on a case-by-case basis for each ambient analysis. Once the background concentration is determined, it is added to the modeled concentration to estimate the total ambient concentration.

There are no ambient monitoring stations near PS 3. Therefore, the Department allowed Alyeska to use ambient data from similar areas to represent the estimated background concentrations at PS 3. The Department also recommended using data from one of the "remote" or "semi-remote" North Slope sites.[18] Alyeska considered several North Slope data sets and selected the "Alaska North Slope Eastern Region" (ANSER) data as the best surrogate of the background concentrations at PS 3. The ANSER data are appropriate estimates of the expected background concentrations at PS 3.

RESULTS AND DISCUSSION

The maximum NO_2, SO_2 and PM-10 AAAQS impacts are shown in Table 1. The background concentrations, total impacts, and ambient standards are also shown. All of the total impacts are less than the applicable AAAQS. Therefore, Alyeska has demonstrated compliance with the AAAQS.

Table 1 – Maximum AAAQS Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_2	Annual	12.2	3	**15.2**	100
SO_2	3-hr	115.6	9.8	**125.4**	1,300
	24-hr	53.6	7.2	**60.8**	365
	Annual	2.9	2.6	**5.5**	80
PM-10	24-hr	18.9	7.9	**26.8**	150
	Annual	0.85	1.8	**2.6**	50

[18] E-Mail from Alan Schuler (ADEC) to Pete Miller (RETEC), *Re: Need info for Alyeska PS3&PS4 modeling protocol*, February 6, 2003.

The maximum NO_2, SO_2 and PM-10 increment impacts are shown in Table 2, along with the Class II increment standards. All of the maximum impacts in Table 2 are less than the applicable Class II standards. Therefore, Alyeska has demonstrated compliance with the Class II increment standards.

Table 2 - Maximum Increment Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc. ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
NO_2	Annual	**11.3**	25
SO_2	3-hr	**115.6**	512
	24-hr	**53.4**	91
	Annual	**2.9**	20
PM-10	24-hr	**14.4**	30
	Annual	**0.62**	17

The maximum modeled impacts occur along the PS 3 fence line. It is important to note that since ambient concentrations vary with distance from each emission unit, the maximum values shown represent the highest value that may occur within the airshed. They do *not* represent the highest concentration that could occur at *each* location in the area.

CONCLUSION

The Department reviewed Alyeska's modeling analysis for PS 3 and concluded the following:

1. The NO_2, SO_2 and PM-10 emissions associated with operating the stationary source within the requested operating limits will not cause or contribute to a violation of the AAAQS listed in 18 AAC 50.010 and the increments listed in 18 AAC 50.020.
2. Aleyska's modeling analysis fully complies with the showing requirements of 18 AAC 50.315(e)(2).
3. Alyeska conducted their modeling analysis in a manner consistent with EPA's *Guideline on Air Quality Models*.

The Department has developed conditions in the air quality control construction permit to ensure compliance with the ambient air quality standards and increments. These conditions are summarized below:

1. Limit the maximum sulfur content of diesel fuel to 0.20 percent, by weight;
2. Limit the maximum fuel gas H_2S content to 150 ppmv;
3. Limit the annual operation of the Cat 3412C to 600 hours;
4. Limit the annual operation of the 65 kW RICE unit to 300 hours; and
5. Limit the annual diesel fuel operation of the dual-fuel Siemens Cyclone turbine to 240 hours.

The Department is also dropping the fuel consumption limits for the existing Weils McClain boilers and Applied Air System heater since they are redundant with the hourly limits (which will remain).

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Appendix B
Revised Modeling Memorandum

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File
DATE: November 18, 2004

FILE NO.: X239 – Modeling

THRU: Jeanette Brena
Construction Permits, Acting Supervisor
Air Permits Program
PHONE: 465-5100
FAX: 465-5129

FROM: Alan Schuler
Environmental Engineer
Air Permits Program
SUBJECT: Revised Review of Alyeska PS 3 Ambient Assessment

This memorandum summarizes the Department's findings regarding the revised ambient assessment submitted by Alyeska Pipeline Service Company (Alyeska) for the "Strategic Reconfiguration Project" at Pump Station 3 (PS 3). Alyeska submitted the revised assessment in support of a November 15, 2004 letter revising their air quality control construction permit application.[19] As described in this memorandum, Alyeska's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010, or the maximum allowable increases (increments) listed in 18 AAC 50.020.[20]

The Department previously approved the ambient demonstration that Alyeska submitted in support of their original permit application. The Department's original findings are documented in my October 21, 2004 memorandum, "Review of Alyeska PS 3 Ambient Assessment." Today's memorandum only addresses those items that have changed subsequent to the October 2004 memorandum.

BACKGROUND/COMMENTS

Alyeska submitted the original ambient assessment on September 10, 2004. The original emission unit inventory included a new 750 kilowatt (kW) Caterpillar 3412C reciprocating internal combustion engine (RICE) black start generator. Alyeska later determined that this unit should instead be a Caterpillar 3516B rated at 2,250 kW. Alyeska is maintaining the requested 600 hour per year operating limit.

Alyeska updated the load analysis and the ambient demonstration with the proper parameters for a 2,250 kW unit. They found that 75% load provides the worst-case nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) impacts and that 50% load provides the worst-case particulate matter (PM-10) impacts for the 2,250 kW unit. In the ambient demonstration, Alyeska also corrected the PM-10 emission rate error noted for the Siemens Cyclone turbines in my October memorandum.

RESULTS AND DISCUSSION

The revised maximum NO_2, SO_2 and PM-10 AAAQS impacts are shown below in Table 1. The background concentrations, total impacts, and ambient standards (AAAQS) are also shown. All of the total impacts are less than the applicable AAAQS.

[19] The Department received an electronic copy of Alyeska's November 15, 2004 letter on November 15, 2004, and the associated modeling files on November 12, 2004. Alyeska verbally notified the Department of the revision prior to submitting the November 15th letter.

[20] Alaska's air quality permit program and associated regulations underwent a major revision that became effective October 1, 2004. Applicants who submitted a complete permit application prior to this date have the option of having their applications processed under either the "new" or "old" program. Per Alyeska's request, the Department is processing the PS 4 application and modeling analysis under the old program/regulations.

Table 1 – Maximum AAAQS Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_2	Annual	12	3	**15**	100
SO_2	3-hr	116	9.8	**125**	1,300
	24-hr	54	7.2	**61**	365
	Annual	2.9	2.6	**5.5**	80
PM-10	24-hr	17	7.9	**25**	150
	Annual	0.8	1.8	**2.6**	50

The maximum NO_2, SO_2 and PM-10 increment impacts are shown in Table 2, along with the Class II increment standards. All of the maximum impacts in Table 2 are less than the applicable Class II standards.

Table 2 - Maximum Increment Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc. ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
NO_2	Annual	**11**	25
SO_2	3-hr	**116**	512
	24-hr	**53**	91
	Annual	**2.9**	20
PM-10	24-hr	**13**	30
	Annual	**0.6**	17

CONCLUSION

The conclusions and recommended permit conditions listed in my October 21, 2004 memorandum are still valid. Please see that memorandum for details.

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